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AIRCRAFT NUCLEAR PROPULSION DEPARTMENT

POWER PLANT WEIGHT STATUS
140E1 (ACT)

E. Phelps
STRESS & WEIGHT ANALYSIS UNIT

March 23, 1961

Serial No. 16752

GENERAL ELECTRIC

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POWER PLANT WEIGHT
STATUS MODEL (ACE)

SH Ahrends
FA Aschenbrenner
JT Cammett
KA Campbell
HS Daniel
PE Duffy
PW Dwyer
LA Feathers
WB Hunter
CC Hussey
DC Layman
FC Linn
PW Lynahan
KF Merten
SH Minnich
TM McQuin
J Neuhoff
H Osgood
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Task 4614
Job 52802

March 23, 1961

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This report supersedes DCL 61-2-127 dated February 24, 1961. The weights listed in the table for April 1, 1961 are calculated weights based on layout drawings released as of March 1, 1961. All weights are computed to nominal dimensions and do not include allowances for manufacturing tolerances and density variations.

The format of the table has been revised to include accessory weights not previously included.

The values in the possible weight changes column have been reviewed by the design unit responsible for the component.

E. Phelps, Ext. 1222
STRESS AND WEIGHT ANALYSIS UNIT

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POWER PLANT WEIGHT STATUS

COMPONENT	140E-1 (ACT) TARGET WEIGHT	ISSUE 10-21-60				ISSUE 11-15-60			
		140E-1 DRAWING WEIGHT	POSSIBLE WEIGHT CHANGES	WEIGHT RANGE		140E-1 DRAWING WEIGHT	POSSIBLE WEIGHT CHANGES	WEIGHT RANGE	
				MAXIMUM	MINIMUM			MAXIMUM	MINIMUM
FRONT SHIELD	6270	5800	- 50 + 786	6569	5750	5850	- 100 + 0.0	5850	5750
Structure		808	+ 723	1531	808	875	± 50	925	825
Material		4942	+ 96	5038	4942	4925		4925	4825
G.T.B. Instru.		50	- 50	----	----	50	- 50	----	----
REAR SHIELD	4930	4605	- 183 + 222	4827	4422	4536	- 26 + 280	4816	4510
Structure		1266	- 1 + 206	1471	1265	1266	- 1 + 306	1571	1265
Material		3289	+ 25+42 - 132	3356	3157	3220	+ 25	3245	3245
G.T.B. Instru.		50	- 50	----	----	50	- 50	----	----
RADIAL SHIELD	13340	13018	+ 500	13518	13018	14877	-1359 - 859	14018	13018
Structure		3395	- 0.00 + 500	3895	3395	4505	- 610 - 100	4395	
Material		9623		9623	9623	10316	- 693	9623	9623
G.T.B. Instru.						56	- 56		
PRESSURE VESSEL	1050	1015	+ 150	1165	1015	1015	+ 150	1165	
TOTAL STRUCTURE		6484		8062	6483	7661	- 661 + 395	8055	
TOTAL MATERIAL		17854		18017	17722	18460	- 668 - 668	17724	
TOTAL INSTRU.						156	- 156	-	
TOTAL SHIELD	25590	24438	+1641 - 233	26079	24205	26278	- 429 -1485	25464	
TOTAL REACTOR	12900	12500	- 300 + 300	12800	12200	12500	- 300 + 300	12800	
Reactor Structure		4074	- 300	4074	3774	4074	- 300	4074	
Reactor Ceramics		8426	+ 300	8726	8426	8426	+ 300	8726	
G.T.B. Instru.									
CONTROLS	1210	1210		1210	1210	1450	- 240	1210	
TOTAL R.S.A.	39700	38148	- 419 +1975	40089	37615	40228	-2025 - 362	39866	
TURBOMACHINERY	16940	18760	-1820 - 440	18320	16940	18760	-1820 - 440	18320	
TOTAL POWER PLANT	56640	56908	-2353 +1501	58409	54555	58988	-3845 - 809	58186	
TOTAL G.T.B. INSTRUMENTATION									
POWER PLANT LESS G.T.B. INSTRU.									

POWER PLANT WEIGHT STATUS

COMPONENT	140E-1 (ACT) TARGET WEIGHT	ISSUE 12-1-60 & 12-15-60				ISSUE 3-1-61			
		140E-1 DRAWING WEIGHT	POSSIBLE WEIGHT CHANGES	WEIGHT RANGE		140E-1 DRAWING WEIGHT	POSSIBLE WEIGHT CHANGES	WEIGHT RANGE	
				MAXIMUM	MINIMUM			MAXIMUM	MINIMUM
FRONT SHIELD	6270	5850	± 50	5900	5800	5850	± 50	5900	5800
Structure		875	± 50	925	825	875	± 50	925	825
Material		4925		4925	4925	4925		4925	4925
G.T.B. Instru.		50		50	50	50		50	50
REAR SHIELD	4930	4536	- 25 + 247	4783	4511	4608	- 25 + 247	4855	4583
Structure		1266	- 25 + 247	1513	1241	1338	- 25 + 247	1585	1313
Material		3220		3220	3220	3220		3220	3220
G.T.B. Instru.		50		50	50	50		50	50
RADIAL SHIELD	13340	14877	- 0 + 200	15167	14787	14907	- 90 + 290	15197	14817
Structure		4505	- 90 + 290	4795	4415	4535	- 90 + 290	4825	4445
Material		10316		10316	10316	10316		10316	10316
G.T.B. Instru.		56		56	56	56		56	56
PRESSURE VESSEL	1050	1015	+ 150 - 0	1165	1015	1097	± 55	1152	1042
TOTAL STRUCTURE		7661	+ 647 - 75	8308	7586	7845	+ 642 - 220	8487	7625
TOTAL MATERIAL		18461		18461	18461	18461		18461	18461
TOTAL INSTRU.		156		156	156	776		776	776
TOTAL SHIELD	25590	26278	+ 647 - 75	26925	26203	27082	+ 642 - 220	27724	26862
TOTAL REACTOR	12900	12500	+ 75 - 75	12575	12425	12400	± 75	12475	12325
Reactor Structure		3774	± 75	3849	3699	3552	± 75	3627	3477
Reactor Ceramics		8426		8426	8426	8548		8548	8548
G.T.B. Instru.		300		300	300	300		300	300
CONTROLS	1210	1450	+ 0 - 240	1450	1210	1450	+ 0 - 240	1450	1210
TOTAL R.S.A.	39700	40228	+ 722 - 390	40950	39838	40932	+ 717 - 535	41649	40397
TURBOMACHINERY	17705	18760	+ 0 -1055	18760	17705	18760	+ 0 -1055	18760	17705
TOTAL POWER PLANT	57405	58988	+ 722 -1445	59710	57543	59692	+ 717 -1590	60409	58102
TOTAL G.T.B. INSTRUMENTATION		306	+ 0 - 0	306	306	676		676	676
POWER PLANT LESS G.T.B. INSTRU.	57405	58682	+ 722 -1445	59404	57237	59016	+ 717 -1590	59733	57426

POWER PLANT WEIGHT STATUS

COMPONENT	140E-1 (ACT) TARGET WEIGHT	ISSUE 1-20-61, 2-1-61				ISSUE 3-1-61			
		140E-1 DRAWING WEIGHT	POSSIBLE WEIGHT CHANGES	WEIGHT RANGE		140E-1 DRAWING WEIGHT	POSSIBLE WEIGHT CHANGES	WEIGHT RANGE	
				MAXIMUM	MINIMUM			MAXIMUM	MINIMUM
FRONT SHIELD	6270	5730	+ 150 - 0	5880	5730	5695	+ 150 - 0	5845	5695
Structure		1015	+ 150 - 0	1165	1015	1015	+ 150 - 0	1165	1015
Material		4665		4665	4665	4630		4630	4630
G.T.B. Instru.		50		50	50	50		50	50
REAR SHIELD	4930	4330	± 75	4405	4255	4370	± 75	4445	4295
Structure		1445	± 75	1520	1370	1480	± 75	1555	1405
Material		2835		2835	2835	2840		2840	2840
G.T.B. Instru.		50		50	50	50		50	50
RADIAL SHIELD	13340	15930	+ 300 - 0	16230	15930	15930	+ 300 - 0	16230	15930
Structure		5740	+ 300 - 0	6040	5740	5730	+ 300 - 0	6040	5730
Material		10100		10100	10100	10100		10100	10100
G.T.B. Instru.		90		90	90	90		90	90
PRESSURE VESSEL	1050	1100	± 55	1155	1045	1100	± 55	1155	1045
TOTAL STRUCTURE		9300	+ 580 - 130	9880	9170	9335		9915	9205
TOTAL MATERIAL		17600		17600	17600	17570		17570	17570
TOTAL INSTRU.		770		770	770	770		770	770
TOTAL SHIELD	25590	27670	+ 580 - 130	28250	27540	27675	+ 580 - 130	28255	27545
TOTAL REACTOR	12900	12530	+ 100 - 200 + 100	12630	12330	12530	+ 100 - 200 + 100	12630	12330
Reactor Structure		3700	- 200	3800	3500	3700	- 200	3800	3500
Reactor Ceramics		8530		8530	8530	8530		8530	8530
G.T.B. Instru.		300		300	300	300		300	300
CONTROLS	1210	1360	+ 0 - 150	1360	1210	1360	+ 0 - 150	1360	1210
TOTAL R.S.A.	39700	41560	+ 680 - 480	42240	41080	41565	+ 680 - 480	42245	41085
TURBOMACHINERY	17705	18760	+ 0 -1055	18760	17705	18760	+ 0 -1055	18760	17705
TOTAL POWER PLANT	57405	60320	+ 680 -1535	61000	58785	60325	+ 680 -1535	61005	58790
TOTAL G.T.B. INSTRUMENTATION		- 670		- 670	- 670	- 670		- 670	- 670
POWER PLANT LESS G.T.B. INSTRU.	57405	59650	+ 680 -1535	60330	58115	59665	+ 680 -1535	60335	58120

POWER PLANT WEIGHT STATUS											
COMPONENT	140E-1 ACT TARGET WEIGHT	ISSUE 4-1-61					ISSUE				
		140E-1 DRAWING WEIGHT	POSSIBLE WEIGHT CHANGES		WEIGHT RANGE		140E-1 DRAWING WEIGHT	POSSIBLE WEIGHT CHANGES		WEIGHT RANGE	
			+	-	MAXIMUM	MINIMUM		+	-	MAXIMUM	MINIMUM
FRONT SHIELD	6270	5695	150	0	5845	5695					
Structure		1015	150	0	1165	1015					
Shielding		4630			4630	4630					
G.T.P. Instru.		50			50	50					
REAR SHIELD	4930	4405	75	75	4480	4330					
Structure		1535	75	75	1610	1460					
Shielding		2820			2820	2820					
G.T.P. Instru.		50			50	50					
SIDE SHIELD	13340	15930	300	0	16230	15930					
Structure		5740	300	0	6040	5740					
Shielding		10100			10100	10100					
G.T.P. Instru.		90			90	90					
PRESSURE VESSEL	1050	1100	55	55	1155	1045					
TOTAL STRUCTURE		9390	580	130	9970	9260					
TOTAL SHIELDING		17550			17550	17550					
TOTAL INSTRU.		770			770	770					
TOTAL SHIELD	25590	27710	580	130	28290	27580					
REACTOR	12900	12530	100	200	12630	12330					
Structure		3700	100	200	3800	3500					
Ceramics		8530			8530	8530					
G.T.P. Instru.		300			300	300					
CONTROLS	1210	1360	0	150	1360	1210					
TOTAL R.S.A.	39700	41600	680	480	42280	41120					
TURBOMACHINERY	17705	18760	0	1055	18760	17705					
TOTAL POWER PLANT	57405	60360	680	1535	61040	58825					
INSTRU.(Non Flight)		670			670	670					
REVISED POWER PLANT	57405	59690	680	1535	60370	58155					
Bellmouth		250			250	250					
Bullet Nose		300			300	300					
Starter		175			175	175					
Disconn. Panels		120			120	120					
Disconn. Panels		90			90	90					
Tube Bundles		135			135	135					
After Cooling Sys.											
Triple Flange Inst.											
TOTAL ACCESSORIES		1070			1070	1070					
FINAL POWER PLANT WEIGHT	57405	60760	680	1535	61440	59225					

FRONT SHIELD COMMENTS

The possible weight changes adding 150 pounds include straps around 2 shielding cylinders to insulate the shielding segments and a spring connection between the reactor core tunnel and the front shield cylinder.

REAR SHIELD COMMENTS

This weight includes the final layout of the Rear Shield Annulus drawing 207R801 released March 1, 1961. It is estimated that the structural weight will vary by approximately ±5% or ± 75 pounds.

SIDE SHIELD COMMENTS

The 140E1 drawing weight includes 11,091 pounds for the side shield less cheeks and forward patch cans, 2955 pounds for the cheek can less low power pqtch at aft end, and 1724 pounds for forward patch cans and support ring and 90 pounds of instrumentation. It is anticipated that 300 pounds will be added to provide structure for ground handling and reinforcement within the cans.

INSTRUMENTATION COMMENTS

The D140E1 drawing weight for the reactor shield assembly is increased bt 620 pounds for remote connectors and wiring from the component to the connectors. Each component has the internal instrumentation included in the component weight. It is estimated that 670 pounds of the instrumentation is primarily for ground test data.

REACTOR COMMENTS

The pressure pads, forward reflector, aft retainer plate, springs, shell and the retractors have been revised in accordance with new drawings. The inner reflector, tunnel, liner, active core, transition pieces, and outer reflector are considered to be the same as the September 30, 1960 release.

It is estimated by O. G. Woike that the overall weight of the reactor may increase 100 pounds or decrease 200 pounds.

CONTROL COMMENTS

The ACT instrumented side shield can contains 5 additional sensing units estimated at 30 pounds each.

TURBOMACHINERY COMMENTS

The anticipated maximum weight for the ACT is taken from X211 requirements Book Section I dated 8-12-60.

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FRONT SHIELD DRAWINGS

Drawing	Sheets	Title
207R820	1	Ref. Front Shield Layout - Final
207R821	2	- Final - Shield, Reactor Shell
*207R822	1	- Shield, Cone
207R823	1	- Cone, Machined
207R824	1	- Compressor Rear Frame Area
207R826	2	- Shield, Pressure Vessel
*207R827	1	- Shield, Reactor Shell Instrumentation
207R828	2	- Island Assembly
207R829	1	- Island Cylinder
*207R830	1	- Island Instrumentation
207R831	1	- Triple Flange
656E781	12	- Island Shield Discs
656E782	1	- Island Support Beam
656E783	1	- Island Control Rod Drive Support
656E785	13	- Island Discs Instrumented
761D108	2	- Island Drag Link
761D109	1	- Island Cowling
761D110	1	- Island Cowling Ring
*761D111	1	- Island Fairing
761D112	3	- Island Shield Blocks
736D961	1	- Core Seal #1
736D983	1	- Compressor Frame Seal
207R840	1	Ref. Pressure Vessel Layout - Final

REAR SHIELD DRAWINGS

207R800	2	Ref. Rear Shield Layout - Final
207R801	1	- Final - Outer Annulus
*207R802	1	- Outer Annulus Instrumentation
*207R803	11	- Forward Island
207R804	6	- Strut Segments
207R805	7	- Aft Island
207R806	3	- Island Instrumentation
207R807	2	- Insulation
207R808	2	- Seals

RADIAL SHIELD DRAWINGS

207R580	3	Ref. Side Shield Layout - Final
207R583	8	Cheek Can Assembly
207R584	4	Upper Right and Left Cans
207R585	6	Upper Center Can
207R586	8	Aft Upper Can Assembly
*207R587	9	Upper Left and Lower Right Side Cans

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RADIAL SHIELD DRAWINGS (continued)

Drawing	Sheets	Title
*207R588	2	Upper Right and Lower Left Side Cans
*207R589	5	Lower Left Can
207R590	7	Lower Center Can
*207R581		Forward Cans Assembly
*207R582		Lower Right Instrumented Can
207R709		Rear Support D140E1 Power Plant Study Layout #3

REACTOR DRAWINGS

*206R687		Ref. Reactor Layout Final-Radial Cross-section
*206R688		-Longitudinal Cross-section
112B1347, Rev. A		Tube-Hex
656E664		Liner
206R651, Rev. A		Shaft Tunnel
736D589		Hub Aft
112B1348, Rev. C		Hex Solid
112B1349, Rev. B		1/2 Hex Across Corners
112B1351, Rev. B		5/6 Hex
114B2601, Rev. A		7/8 Hex
112B1350, Rev. B		1/2 Hex Across Flats
936C199		Fuel Tubes
114B2080		Radial Arch
656E662		Poison Tip
207R694		Forward Reflector
206R697		Forward Reflector Be Block
296R690		Forward Reflector Sector
736D570		Transition Piece
*196R707		Aft Retainer Insulation
207R904		Aft Retainer
207R903		Reactor Shell
*737R757		Springs
645D797		Baffles
737D751		Retainers

OVERALL POWER PLANT DRAWINGS

206R586, Rev. E	D140E1 Power Plant Reference Design Layout

* Indicates drawings that have estimated weights only.